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.. not available for a specific reference period
... not applicable
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0[s] value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
[p] preliminary
[r] revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
[E] use with caution
F too unreliable to be published
* significantly different from reference category ($p < 0.05$)

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Association between breastfeeding and select chronic conditions among off-reserve First Nations, Métis and Inuit children in Canada

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Overview of the study

This paper examines associations between breastfeeding and select chronic conditions—asthma/chronic bronchitis and chronic ear infections—among off-reserve First Nations, Métis and Inuit children in Canada aged 1 to 5 years. Data are from the 2006 Aboriginal Children's Survey, and each Aboriginal group was studied separately. Two aspects of breastfeeding are examined: feeding history (e.g. bottle-fed, breastfed, or both) and duration of breastfeeding.

- About 60% of off-reserve First Nations, Métis and Inuit children aged 1 to 5 were both bottle-fed and breastfed. The proportion of those who were only breastfed varied between 14% and 17%, while the proportion of those who were only bottle-fed varied between 23% and 25%.
- Breastfed children were found to have a lower prevalence of asthma/chronic bronchitis. Among off-reserve First Nations children, for instance, 14% of those who were only bottle-fed had asthma/chronic bronchitis, compared with 10% of those who were only breastfed.
- Among off-reserve First Nations children, those who were breastfed had a lower prevalence of chronic ear infections. Of those who were only bottle-fed, 5%[E] reported chronic ear infections compared with 2%[E] of those who were only breastfed.
- Off-reserve First Nations children who were breastfed for more than six months had a lower prevalence of asthma/chronic bronchitis and chronic ear infections than their counterparts who were never breastfed.
- The findings described above remained significant even when clinical, demographic, and socio-economic factors were taken into account in a model. Results indicate that factors other than breastfeeding are also associated with health outcomes.

Introduction

Past research has shown breastfeeding to be protective for infant and child health.[1] Human milk contains biologically active substances that stimulate and strengthen the infant immune system with antimicrobial and anti-inflammatory agents, unlike infant feeding formula.[2] In addition, the functional physiology of infants who are breastfed is different from infants who are bottle-fed due to pressure and suck, which prevents the pooling of milk in the middle ear and the consequent proliferation of bacteria.[3] Health Canada recommends that infants should be exclusively breastfed for the first six months of life to ensure the best nutrition for the optimal health, growth and development of infants and toddlers.[4]

Previous literature on infant and child health has suggested that breastfeeding is protective against several negative health outcomes.[5] In particular, research specific to Aboriginal infants and children in Canada

has found that breastfeeding is related to better general health and a lower prevalence of specific health problems such as asthma, respiratory tract infections, ear infections (otitis) and gastrointestinal infections.[6]

That said, previous research has often focused on a single Aboriginal identity group (sometimes within small levels of geography) or has combined data for multiple Aboriginal groups. This study uses data from the 2006 Aboriginal Children's Survey to examine associations between breastfeeding and select chronic conditions—asthma/chronic bronchitis and chronic ear infections—for each of three Aboriginal identity groups. The sample was restricted to off-reserve First Nations, Métis and Inuit children, aged 1 to 5 years,[7] whose birth mother responded to the survey (see "Data sources, methods and definitions").

Exclusive breastfeeding, as defined by Health Canada, is when an infant is only fed breastmilk—no other liquids (not even water) or food.[8] However, it was not possible to create a variable with the data based on this definition as it was not possible to determine whether children in the study received solid foods as infants or not. Thus, two distinct breastfeeding variables were created to test for differences between breastfeeding and bottle-feeding, and to test for differences by duration of breastfeeding. Neither should be confused nor conflated with exclusive breastfeeding (i.e., without solid food or any other liquid), and it should be noted that children who were only bottle-fed/never breastfed may have been fed breastmilk in their bottles.

Table 1
Distribution of children aged 1 to 5 by selected demographic, breastfeeding and health characteristics, by Aboriginal identity, 2006

	Aboriginal identity		
	Off-reserve First Nations	Métis	Inuit
	percent		
Sex			
Females	50.1	47.8	49.3
Males	49.8	52.1	50.6
Age group			
1 to 3 years	59.6	58.1	58.6
4 to 5 years	40.3	41.8	41.3
Feeding history			
Only breastfed	14.4	14.9	17.2
Both breastfed and bottle-fed	61.4	60.2	59.8
Only bottle-fed[1]	24.0	24.8	22.8
Breastfeeding duration			
Never breastfed[2]	24.8	25.2	25.0
Breastfed 0 to 6 months	41.1	42.4	31.6
Breastfed more than 6 months	33.9	32.3	43.3
Asthma/chronic bronchitis			
Yes	11.2	11.1	8.1
No	88.7	88.8	91.8
Ear infections			
At least one since birth	54.3	55.0	50.7
Chronic[3]	4.0	3.7	8.7
None	45.6	44.9	49.2

1. Note that children who were only bottle-fed may have been bottle-fed breastmilk.
2. Percentages for the Only bottle-fed and Never breastfed categories are different because a small number of children were reported as never having been breastfed or bottle-fed.
3. Four or more ear infections in the last 12 months.

Note: The sample consists of children whose birth mother responded to the survey.

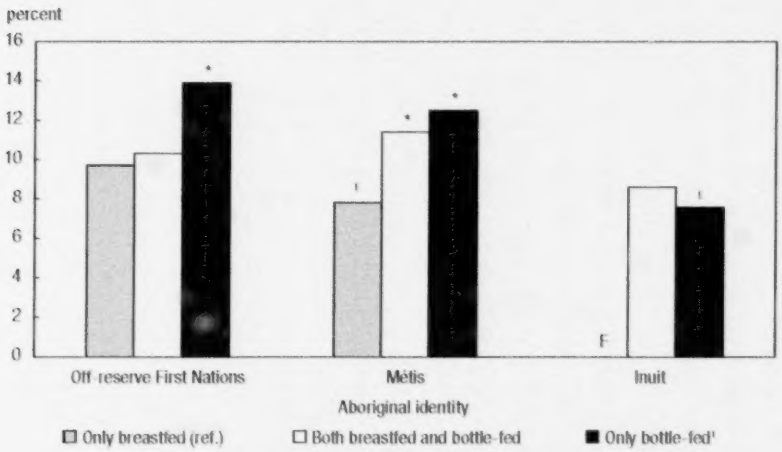
Source: Statistics Canada, Aboriginal Children's Survey (ACS), 2006.

The first section of this article uses descriptive statistics to examine the distributions of select demographic, breastfeeding and health characteristics of off-reserve First Nations, Métis and Inuit children aged 1 to 5. The following sections present results of the descriptive and logistic regression analyses for two outcome variables (asthma/chronic bronchitis and chronic ear infections) by each breastfeeding variable (feeding history and breastfeeding duration). The purpose of the logistic regression analysis is to determine whether associations between breastfeeding and health outcomes remain after the influence of several demographic, social, economic and health characteristics are controlled for.

Among off-reserve First Nations, Métis and Inuit children aged 1 to 5, 6 in 10 were both breastfed and bottle-fed

With the 2006 Aboriginal Children's Survey, it is possible to derive proportions of Aboriginal children aged 1 to 5 who were only breastfed, only bottle-fed, or who were both breastfed and bottle-fed.[9] The majority of off-reserve First Nations (61%), Métis (60%), and Inuit (60%) children, aged 1 to 5,

Chart 1
Proportion of children aged 1 to 5 with asthma/chronic bronchitis, by Aboriginal identity and feeding history, 2006



[1] use with caution
F too unreliable to be published
* significantly different from reference category (ref.) ($p < 0.05$)
1. Note that children who were only bottle-fed may have been bottle-fed breastmilk.
Note: The sample consists of children whose birth mother responded to the survey.
Source: Statistics Canada, Aboriginal Children's Survey (ACS), 2006.

were both breastfed and bottle-fed (Table 1). Inuit children were most likely to have been only breastfed (not bottle-fed), which was the case for 17% of Inuit children, versus 14% for off-reserve First Nations children and 15% for Métis children. Conversely, almost one-quarter of off-reserve First Nations, Métis and Inuit children were only bottle-fed.

More Inuit children were breastfed for more than six months than off-reserve First Nations or Métis children. A larger proportion of off-reserve First Nations (41%) and Métis (42%) children were breastfed from zero to six months, whereas a larger proportion of Inuit children (43%) were breastfed for more than six months. About one-quarter of children in each Aboriginal identity group were not breastfed. It is important to note that cultural practices among Inuit, such as traditional adoption, play a role in breastfeeding initiation and practices,[10] and that although Inuit generally have lower breastfeeding rates than other Aboriginal groups and the non-Aboriginal population, Inuit children tend to be breastfed for longer periods of time.

In 2006, about 11% of off-reserve First Nations, 11% of Métis and 8% of Inuit children aged 1 to 5 had diagnosed asthma or chronic bronchitis. According to another study based on data from the National Longitudinal Survey of Children and Youth (NLSCY), asthma prevalence in remote and northern communities in Canada is lower for Aboriginal children than it is for non-Aboriginal children.[11]

Off-reserve First Nations and Métis children who were breastfed had lower rates of asthma/chronic bronchitis than bottle-fed children

Asthma has been named as one of the most common chronic conditions among off-reserve First Nations, Métis and Inuit children in Canada.[12] In addition, Aboriginal children suffer from more severe respiratory infections and are more frequently admitted for hospitalization than non-Aboriginal children.[13] Previous research on the general population has found that breastfeeding is associated with a lower prevalence of respiratory illnesses, such as asthma and lower respiratory tract infections.[14] Research specific to Aboriginal children in Canada has produced similar results.[15]

Over the next sections, descriptive results will be discussed, as well as the logistic regression analysis, which examined the relationship between breastfeeding and asthma/chronic bronchitis while taking numerous important factors into account. The analysis was conducted separately for each Aboriginal identity group.

Among off-reserve First Nations and Métis children, children who were only breastfed had lower rates of asthma/chronic bronchitis (10% of off-reserve First Nations and 8%[E] of Métis) than their counterparts who were only bottle-fed (14% and 13%, respectively) (Chart 1). In addition,

Métis children who were only breastfed had a lower prevalence of asthma/chronic bronchitis (8%[E]) than Métis children who were both breastfed and bottle-fed (11%).

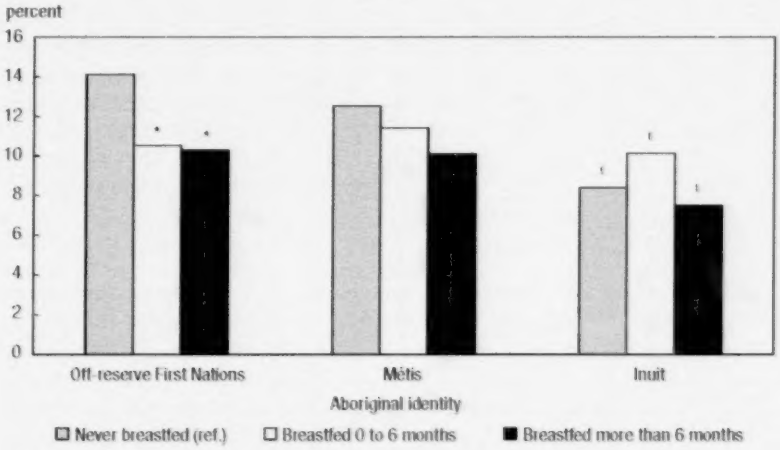
Similar results were obtained when a variable indicative of breastfeeding duration was used among off-reserve First Nations children. Specifically, off-reserve First Nations children who were ever breastfed—for up to six months (11%) or for more than six months (10%)—had lower rates of asthma/chronic bronchitis than children who were never breastfed (14%) (Chart 2).

Off-reserve First Nations children who were breastfed had a lower likelihood of asthma/chronic bronchitis after several factors were controlled for

After several clinical, demographic and socioeconomic characteristics were controlled for in a logistic regression model, the results showed that breastfeeding was associated with a lower likelihood of asthma/chronic bronchitis among off-reserve First Nations children. First Nations children living off reserve who were only breastfed were less likely to have asthma/chronic bronchitis (9%) than their counterparts who were only bottle-fed (14%). There was no significant relationship between breastfeeding and the presence of asthma/chronic bronchitis among Métis or Inuit children (Table 2).

The breastfeeding duration variable also indicated that children who had never been breastfed had a higher likelihood of asthma/chronic bronchitis among First Nations children living off reserve. Children who were breastfed up to six months

Chart 2
Proportion of children aged 1 to 5 with asthma/chronic bronchitis, by Aboriginal identity and breastfeeding duration, 2006



E use with caution
* significantly different from reference category (ref.) ($p < 0.05$)
Note: The sample consists of children whose birth mother responded to the survey.
Source: Statistics Canada, Aboriginal Children's Survey (ACS), 2006.

Table 2
Predicted probability of asthma/chronic bronchitis for two breastfeeding variables, by Aboriginal identity for children aged 1 to 5, 2006

	Aboriginal identity		
	Off-reserve First Nations	Métis	Inuit
	predicted probability		
Feeding history			
Only breastfed (ref.)	0.09	0.08	0.06
Both breastfed and bottle-fed	0.11	0.12	0.09
Only bottle-fed[1]	0.14*	0.12	0.08
Breastfeeding duration			
Never breastfed (ref.)	0.14	0.12	0.09
Breastfed 0 to 6 months	0.11	0.12	0.09
Breastfed more than 6 months	0.10*	0.10	0.09

* significantly different from reference category (ref.) ($p < 0.05$)
1. Note that children who were only bottle-fed may have been bottle-fed breastmilk.
Notes: The sample consists of children whose birth mother responded to the survey. Predicted probabilities are derived from marginal effects at the mean, based on logistic regressions. Each breastfeeding variable was run in separate models that included various factors. Full model results for each variable are available in the "Supplementary information section".
Source: Statistics Canada, Aboriginal Children's Survey (ACS), 2006.

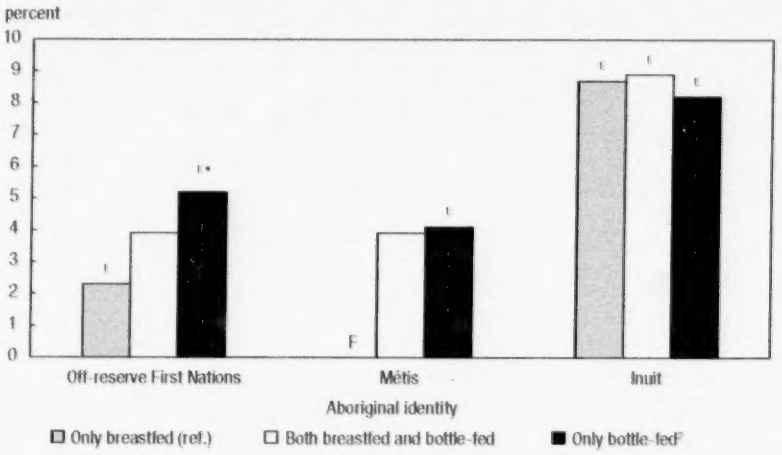
(11%) and who were breastfed for more than six months (10%) were less likely to have asthma/chronic bronchitis than children who were never breastfed (14%).[16]

Model results, however, also show that other factors were associated with a lower prevalence of asthma. Having respiratory allergies or being diagnosed with tuberculosis, for instance, was significantly associated with a higher probability of asthma/chronic bronchitis in all three groups of Aboriginal children. Similarly, a higher prevalence of asthma/chronic bronchitis was found among off-reserve First Nations and Inuit children whose mothers had difficulty accessing health care. Full model results are available in tables A1 (with the feeding history variable) and A2 (with the breastfeeding duration variable) in the "Supplementary information" section.

Off-reserve First Nations children who were only breastfed had a lower prevalence of chronic ear infections

Ear infections are a leading cause of hospitalization among Aboriginal children in Canada.[17] More specifically, middle ear infections are a common health problem for young children in Canada,[18] which may be associated with a number of health and developmental issues such as hearing impairment, delayed speech and language development, as well as delayed academic and educational development.[19] First Nations, Métis and Inuit children in northern Canada are disproportionately affected by middle ear infections, with prevalence rates in some communities around 40 times higher than in the urban South.[20]

Chart 3
Proportion of children aged 1 to 5 with chronic ear infections,[1] by Aboriginal identity and feeding history, 2006



E use with caution
F too unreliable to be published
* significantly different from reference category (ref.) ($p < 0.05$)
1. Chronic ear infections denote four or more ear infections in the last 12 months.
2. Note that children who were only bottle-fed may have been bottle-fed breastmilk.
Note: The sample consists of children whose birth mother responded to the survey.
Source: Statistics Canada, Aboriginal Children's Survey (ACS), 2006.

In this study, chronic ear infections were defined as four or more ear infections in the last 12 months. This section presents the results of the descriptive and logistic regression analyses, which examined the relationships between feeding history and breastfeeding duration for chronic ear infections for each of the three Aboriginal identity groups.

Given the relatively small sample size of children who reported chronic ear infections, the results must be interpreted with caution. However, there was a significant difference in the prevalence of chronic ear infections between off-reserve First Nations children who were only breastfed (2%[E]) and those who were only bottle-fed (5%[E]) (Chart 3). Off-reserve First Nations children who were breastfed for more than six months had a lower prevalence of chronic ear infections (3%[E]) than off-reserve First Nations children who were not breastfed (5%[E]) (data not shown).[21]

Off-reserve First Nations children who were breastfed had a lower prevalence chronic ear infections after several factors were controlled for

After several factors were controlled for in a logistic regression model, First Nations children living off reserve who were only breastfed

Table 3
Predicted probability of chronic ear infections for two breastfeeding variables, by Aboriginal identity for children aged 1 to 5, 2006

	Aboriginal identity		
	Off-reserve First Nations	Métis	Inuit
	predicted probability		
Feeding history			
Only breastfed (ref.)	0.02	0.03	0.13
Both breastfed and bottle-fed	0.04	0.04	0.08
Only bottle-fed[1]	0.05*	0.04	0.06
Breastfeeding duration			
Never breastfed (ref.)	0.05	0.04	0.07
Breastfed 0 to 6 months	0.04	0.04	0.10
Breastfed more than 6 months	0.03*	0.03	0.07

* significantly different from reference category (ref.) ($p < 0.05$)

1. Note that children who were only bottle-fed may have been bottle-fed breastmilk.

Notes: The sample consists of children whose birth mother responded to the survey. Predicted probabilities are derived from marginal effects at the mean, based on logistic regressions. Each breastfeeding variable was run in separate models that included various factors. Full model results for each variable are available in the tables in the "Supplementary information" section.

Source: Statistics Canada, Aboriginal Children's Survey (ACS), 2006.

were significantly less likely to have chronic ear infections (2%) than children who were only bottle-fed (5%) (Table 3). Likewise, off-reserve First Nations children who were breastfed for more than six months were significantly less likely to have chronic ear infections (3%) than their counterparts who were not breastfed (5%). In contrast, no association was found between chronic ear infections and breastfeeding among Métis and Inuit children.

As was the case with the results for asthma/chronic bronchitis, the models also showed that other factors were associated with chronic ear infections. Exposure to second hand smoke at home was associated with a higher prevalence of chronic ear infections among Métis and Inuit children. Among Inuit children, those living outside of Inuit Nunangat had a lower probability of having chronic ear infections than those who lived in Inuit Nunangat.[22] Readers interested in the full model results are invited to consult tables A3 and A4 in the "Supplementary information" section.

Conclusion

The findings for First Nations children living off reserve suggest that there is a relationship between breastfeeding and the health outcomes in this study. This relationship continued to be significant after several clinical, demographic and socioeconomic characteristics were controlled for. In addition, children who were breastfed for longer periods of time, such as for more than six months, had lower prevalence and lower likelihood of asthma/chronic bronchitis and chronic ear infections. These results are consistent with past research on breastfeeding and health among the general population, and with research specific to Aboriginal populations.[23]

However, breastfeeding was not found to be associated with better health outcomes across all Aboriginal populations. Specifically, no association was found between breastfeeding and asthma/chronic bronchitis or between breastfeeding and chronic ear infections among Métis or Inuit children.

The logistic regression results also indicate that there may be other factors with more influence on health outcomes than breastfeeding, such as socioeconomic status and living conditions (full model results are available in the "Supplementary information" section). Past research has also shown that infants living in low income are less likely to have been breastfed than infants from higher socioeconomic backgrounds.[24]

Overall, these findings have implications for research specific to Aboriginal peoples, and as such, care should be taken not to generalize or apply findings from general population studies or from studies that combine multiple Aboriginal groups to single Aboriginal populations.

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Data sources, methods and definitions

Data source

The Aboriginal Children's Survey (ACS) is a postcensal survey that was conducted once—by Statistics Canada in 2006. The target population was all children in Canada under the age of 6 (as of October 31, 2006),[25] with First Nations (North American Indian), Métis or Inuit identity or ancestry. However, a small number of children were 6 years of age by the time of the survey. Children living in institutions and children living on reserve in the provinces were excluded. The final sample size was 12,845.

Data from this survey are weighted with respect to the child, unlike other data sources such as the Aboriginal Peoples Survey (APS) and the Canadian Community Health Survey (CCHS), which are weighted with respect to the mother. As such, breastfeeding prevalence is not measured in this study. For information related to breastfeeding prevalence among Aboriginal and non-Aboriginal people, consult CANSIM tables 105-0512 and 105-0515 on Statistics Canada's website.

Methods

This study's results were produced using descriptive and logistic regression analyses. Variances were estimated using bootstrap weights[26] available from the Aboriginal Children's Survey data files.[27] Four breastfeeding variables were tested separately in the models: ever breastfed versus never breastfed; feeding history; and two versions of breastfeeding duration (breastfed up to six months or more, and breastfed up to 12 months or more). Although feeding history and breastfeeding duration at six months were selected as the main breastfeeding variables, results are similar for all four breastfeeding variables.

Sample

The sample consists of off-reserve First Nations, Métis and Inuit children in Canada aged 1 to 5 years. Children with Aboriginal identity were selected, and only children with single responses for First Nations, Métis or Inuit categories. The sample was also restricted to children whose birth mother responded to the survey. Birth mothers were selected as respondents not only for consistency with previous research, but also because they are the most likely to have the best knowledge and recall of the child's health and feeding history.[28] Given the small sample sizes in some cases, results that must be interpreted with caution have been marked with an 'E' and results that are too unreliable to be published have been marked with an 'F'.

Definitions

The variables used in this study are based on the literature and previous studies, but are limited by data available in the 2006 Aboriginal Children's Survey (ACS). Four types of independent variables were used: clinical, demographic, socioeconomic, and other variables. Clinical variables were included to control for the risk of illness due to co-morbid conditions. For example, ear infections have been found to be significantly associated with the risk of asthma and wheezing (for children who have not received an asthma diagnosis).[29]

Multiple definitions of breastfeeding and breastfeeding duration were tested in this study. The variable that is closest to Health Canada's definition of exclusive breastfeeding is feeding history, which examines children who were only breastfed, only bottle-fed, or who were both breastfed and bottle-fed. Please note that children who were only bottle-fed/never breastfed may have been fed breastmilk in their bottles.

Asthma/chronic bronchitis was diagnosed by a health professional, as reported by the child's mother.

Chronic ear infections denotes four or more ear infections in the past 12 months, as reported by the mother.

Limitations

The analyses in this study are limited by the variables collected in the survey, as the 2006 Aboriginal Children's Survey (ACS) was not conducted on reserve. Although the literature on asthma has shown that the presence of dampness and mould have an effect on the prevalence of asthma in children,[30] data on indoor air quality was not available through the survey. Furthermore, the ACS does not include information on other predisposing health conditions that could be related to the health outcomes examined in this study, such as respiratory tract infections.

Sample size was also an issue in this study. Power analysis indicated that the models for Inuit generally had small sample sizes. However, when the models were run for all types of respondents, the results did not change even though the sample size for Inuit had increased and was much closer to the desired size. Bivariate statistical tests between each breastfeeding variable and each outcome produced similar results to those from the multivariate logistic regression.

Cultural variables such as the birth mother's primary language (Aboriginal language versus non-Aboriginal); the importance of First Nations, Métis and Inuit history and culture to the mother; and the frequency at which the child participated in traditional activities were tested throughout the model-building process. However, these variables were not significantly associated with the health outcomes in the study. It was also unclear whether these variables serve as adequate proxies for cultural involvement, thus they were excluded from analysis.

Supplementary information

The tables in this section show the full logistic regression model results used for tables 2 and 3 in this article.

Table A1
Predicted probability of asthma/chronic bronchitis by feeding history and selected characteristics, by Aboriginal identity for children aged 1 to 5, 2006

	Aboriginal identity		
	Off-reserve First Nations	Métis	Inuit
	predicted probability		
Primary predictor			
Feeding history			
Only breastfed (ref.)	0.09	0.08	0.06
Both breastfed and bottle-fed	0.11	0.12	0.09
Only bottle-fed[1]	0.14*	0.12	0.08
Demographic characteristics			
Sex			
Female (ref.)	0.09	0.10	0.08
Male	0.14***	0.12	0.09
Age group			
1 to 3 years (ref.)	0.10	0.09	0.09
4 to 5 years	0.13*	0.14***	0.07
Area of residence (child)[2]			
Urban (ref.) / For Inuit only: Inuit Nunangat (ref.)	0.12	0.11	0.07
Rural / For Inuit only: Outside Inuit Nunangat	0.09	0.11	0.12
Clinical variables			
Birth weight			
2,500 grams or more (ref.)	0.11	0.11	0.08
Less than 2,500 grams	0.13	0.14	0.15
Comorbidity, respiratory allergies or tuberculosis			
Neither (ref.)	0.10	0.09	0.07
At least one	0.52***	0.48***	0.51***
Comorbidity, ear infections			
None (ref.)	0.08	0.08	0.04
At least one since birth	0.14***	0.14***	0.13***
Socioeconomic factors and housing conditions			
Education (birth mother)			
Some postsecondary or more (ref.)	0.11	0.12	0.08
High school graduate	0.11	0.09*	0.09
Less than high school	0.12	0.12	0.08
Socioeconomic factors and housing conditions			
Household income, adjusted for household size			
At the median or above (ref.)	0.12	0.09	0.07
Below the median	0.11	0.13**	0.09
Condition of dwelling			
Home in need of minor repairs or regular maintenance (ref.)	...	0.11	...
Home in need of major repairs	...	0.14	...
Exposure to second-hand smoke at home			
Child is not exposed regularly (ref.)	0.11	0.11	0.08
Child is exposed regularly	0.11	0.11	0.07
Hunger (child)			
No hunger (ref.)	...	0.11	0.09
Child has experienced hunger in this household	...	0.06	0.06
Other factors			
Difficulty accessing health care (birth mother)			
No difficulty (ref.)	0.10	0.11	0.07
Could not get health care or medication for the child	0.19***	0.15	0.19***
Regular child care			
Child in regular child care (ref.)	0.11	0.13	0.08
Child not in regular child care	0.11	0.09**	0.08
Presence of older children at home			
None (ref.)	0.11	0.09	0.08
One older child or more (under the age of 15)	0.11	0.13*	0.08

... not applicable. This variable was excluded from the model for this Aboriginal identity group.

* significantly different from reference category (ref.) ($p < 0.05$)

** significantly different from reference category (ref.) ($p < 0.01$)

*** significantly different from reference category (ref.) ($p < 0.001$)

1. Note that children who were only bottle-fed may have been bottle-fed breastmilk.

2. The area of residence variable has different categories for Inuit, Inuit Nunangat and Outside Inuit Nunangat.

Notes: The sample consists of children whose birth mother responded to the survey. Predicted probabilities are derived from marginal effects at the mean, based on logistic regressions.

Source: Statistics Canada, Aboriginal Children's Survey (ACS), 2006.

Table A2

Predicted probability of asthma/chronic bronchitis by breastfeeding duration and selected characteristics, by Aboriginal identity for children aged 1 to 5, 2006

	Aboriginal identity		
	Off-reserve First Nations	Métis	Inuit
	predicted probability		
Primary predictor			
Breastfeeding duration			
Never breastfed (ref.)	0.14	0.12	0.09
Breastfed 0 to 6 months	0.11	0.12	0.09
Breastfed more than 6 months	0.10*	0.10	0.09
Demographic characteristics			
Sex			
Female (ref.)	0.09	0.10	0.08
Male	0.14***	0.12	0.09
Age group			
1 to 3 years (ref.)	0.10	0.09	0.11
4 to 5 years	0.13*	0.14***	0.07
Area of residence (child)[1]			
Urban (ref.) / For Inuit only: Inuit Nunangat (ref.)	0.12	0.11	0.07
Rural / For Inuit only: Outside Inuit Nunangat	0.10	0.11	0.13
Clinical variables			
Birth weight			
2,500 grams or more (ref.)	0.11	0.11	0.08
Less than 2,500 grams	0.13	0.14	0.16
Comorbidity, respiratory allergies or tuberculosis			
None (ref.)	0.10	0.09	0.08
At least one since birth	0.53***	0.49***	0.50***
Comorbidity, ear infections			
None (ref.)	0.08	0.08	0.04
At least one since birth	0.14***	0.14***	0.14***
Socioeconomic factors and housing conditions			
Education (birth mother)			
Some postsecondary or more (ref.)	0.11	0.12	0.08
High school graduate	0.11	0.09*	0.09
Less than high school	0.13	0.12	0.09
Socioeconomic factors and housing conditions			
Household income, adjusted for household size			
At the median or above (ref.)	0.12	0.09	0.08
Below the median	0.11	0.13**	0.10
Condition of dwelling			
Home in need of minor repairs or regular maintenance (ref.)	...	0.11	...
Home in need of major repairs	...	0.14	...
Exposure to second-hand smoke at home			
Child is not exposed regularly (ref.)	0.11	0.11	0.09
Child is exposed regularly	0.11	0.11	0.09
Hunger (child)			
No hunger (ref.)	...	0.11	0.09
Child has experienced hunger in this household	...	0.06	0.07
Other factors			
Difficulty accessing health care (birth mother)			
No difficulty (ref.)	0.10	0.15	0.08
Could not get health care or medication for the child	0.20***	0.11	0.21**
Regular childcare			
Child in regular child care (ref.)	0.12	0.13	0.09
Child not in regular child care	0.11	0.09**	0.09
Presence of older children at home			
None (ref.)	0.11	0.09	0.08
One older child or more (under the age of 15)	0.11	0.13*	0.09

... not applicable. This variable was excluded from the model for this Aboriginal identity group.

* significantly different from reference category (ref.) ($p < 0.05$)

** significantly different from reference category (ref.) ($p < 0.01$)

*** significantly different from reference category (ref.) ($p < 0.001$)

1. The area of residence variable has different categories for Inuit, Inuit Nunangat and Outside Inuit Nunangat.

Notes: The sample consists of children whose birth mother responded to the survey. Predicted probabilities are derived from marginal effects at the mean, based on logistic regressions.

Source: Statistics Canada, Aboriginal Children's Survey (ACS), 2006.

Table A3

Predicted probability of chronic ear infections by feeding history and selected characteristics, by Aboriginal identity for children aged 1 to 5, 2006

	Aboriginal identity		
	Off-reserve First Nations	Métis	Inuit
	predicted probability		
Primary predictor			
Feeding history			
Only breastfed (ref.)	0.02	0.03	0.13
Both breastfed and bottle-fed	0.04	0.04	0.08
Only bottle-fed[1]	0.05*	0.04	0.06
Demographic characteristics			
Sex			
Female (ref.)	0.04	0.04	0.06
Male	0.04	0.04	0.10*
Age group			
1 to 3 years (ref.)	0.05	0.05	0.09
4 to 5 years	0.03*	0.02**	0.07
Area of residence (child)[2]			
Urban (ref.) / For Inuit only: Inuit Nunangat (ref.)	0.04	0.04	0.10
Rural / For Inuit only: Outside Inuit Nunangat	0.04	0.02*	0.03*
Clinical variables			
Birth weight			
2,500 grams or more (ref.)	0.04	0.04	0.08
Less than 2,500 grams	0.07	0.06	0.10
Comorbidity, asthma or chronic bronchitis			
Neither (ref.)	0.03	0.03	0.07
At least one	0.09***	0.11***	0.21***
Comorbidity, allergies			
None (ref.)	0.04	0.04	0.07
Food, digestive, respiratory, or other	0.04	0.05	0.18***
Socioeconomic factors and housing conditions			
Education (birth mother)			
Some postsecondary or more (ref.)	0.04	0.04	0.06
High school graduate	0.04	0.04	0.05
Less than high school	0.04	0.03	0.10
Socioeconomic factors and housing conditions			
Household income, adjusted for household size			
At the median or above (ref.)	0.03	0.03	0.08
Below the median	0.04	0.04	0.08
Household crowding[3]			
One person or less per room (ref.)	...	...	0.07
More than one person per room	...	...	0.09
Exposure to second-hand smoke at home			
Child is not exposed regularly (ref.)	0.04	0.03	0.09
Child is exposed regularly	0.05	0.06*	0.03**
Hunger (child)			
No hunger (ref.)	0.04	0.04	0.09
Child has experienced hunger in this household	0.04	0.04	0.06
Other factors			
Gone to bed with a bottle (child)			
Never (ref.)	0.05	0.05	0.05
Yes	0.03*	0.03	0.10
Difficulty accessing health care (birth mother)			
No difficulty (ref.)	0.04	0.04	0.08
Could not get health care or medication for the child	0.06	0.06	0.05
Regular child care			
Child in regular child care (ref.)	0.05	0.05	0.10
Child not in regular child care	0.03*	0.02**	0.07
Mobility (child)			
Never moved (ref.)	0.05	0.04	0.07
Moved at least once	0.03*	0.04	0.09

... not applicable. This variable was excluded from the model for this Aboriginal identity group.

* significantly different from reference category (ref.) ($p < 0.05$)

** significantly different from reference category (ref.) ($p < 0.01$)

*** significantly different from reference category (ref.) ($p < 0.001$)

1. Note that children who were only bottle-fed may have been bottle-fed breastmilk.

2. The area of residence variable has different categories for Inuit, Inuit Nunangat and Outside Inuit Nunangat.

3. For household crowding, rooms exclude bathrooms, halls, and rooms used for business.

Notes: The sample consists of children whose birth mother responded to the survey. Predicted probabilities are derived from marginal effects at the mean, based on logistic regressions.

Source: Statistics Canada, Aboriginal Children's Survey (ACS), 2006.

Table A4
Predicted probability of chronic ear infections by breastfeeding duration and selected characteristics, by Aboriginal identity for children aged 1 to 5, 2006

	Aboriginal identity		
	Off-reserve First Nations	Métis	Inuit
	predicted probability		
Primary predictor			
Breastfeeding duration			
Never breastfed (ref.)	0.05	0.04	0.07
Breastfed 0 to 6 months	0.04	0.04	0.10
Breastfed more than 6 months	0.03*	0.03	0.07
Demographic characteristics			
Sex			
Female (ref.)	0.04	0.04	0.06
Male	0.04	0.04	0.10
Age group			
1 to 3 years (ref.)	0.05	0.05	0.09
4 to 5 years	0.03*	0.02**	0.07
Area of residence (child)[1]			
Urban (ref.) / For Inuit only: Inuit Nunangat (ref.)	0.04	0.04	0.10
Rural / For Inuit only: Outside Inuit Nunangat	0.04	0.02*	0.03*
Clinical variables			
Birth weight			
2,500 grams or more (ref.)	0.04	0.04	0.08
Less than 2,500 grams	0.07	0.06	0.10
Comorbidity, asthma or chronic bronchitis			
None (ref.)	0.03	0.03	0.07
At least one since birth	0.09***	0.11***	0.22***
Comorbidity, allergies			
None (ref.)	0.04	0.04	0.07
Food, digestive, respiratory, or other	0.04	0.05	0.17**
Socioeconomic factors and housing conditions			
Education (birth mother)			
Some postsecondary or more (ref.)	0.04	0.04	0.06
High school graduate	0.04	0.04	0.05
Less than high school	0.04	0.03	0.10
Socioeconomic factors and housing conditions			
Household income, adjusted for household size			
At the median or above (ref.)	0.03	0.03	0.07
Below the median	0.04	0.04	0.08
Household crowding[2]			
One person or less per room (ref.)	...	...	0.07
More than one person per room	...	...	0.09
Exposure to second-hand smoke at home			
Child is not exposed regularly (ref.)	0.04	0.03	0.09
Child is exposed regularly	0.05	0.06*	0.03**
Hunger (child)			
No hunger (ref.)	0.04	0.04	0.09
Child has experienced hunger in this household	0.04	0.04	0.06
Other factors			
Gone to bed with a bottle (child)			
Never (ref.)	0.05	0.05	0.06
Yes	0.03	0.03	0.09
Difficulty accessing health care (birth mother)			
No difficulty (ref.)	0.04	0.04	0.08
Could not get health care or medication for the child	0.06	0.06	0.06
Regular childcare			
Child in regular child care (ref.)	0.05	0.05	0.09
Child not in regular child care	0.03	0.02**	0.07
Mobility (child)			
Never moved (ref.)	0.05	0.04	0.07
Moved at least once	0.03*	0.04	0.09

... not applicable. This variable was excluded from the model for this Aboriginal identity group.

* significantly different from reference category (ref.) ($p < 0.05$)

** significantly different from reference category (ref.) ($p < 0.01$)

*** significantly different from reference category (ref.) ($p < 0.001$)

1. The area of residence variable has different categories for Inuit, Inuit Nunangat and Outside Inuit Nunangat.

2. For household crowding, rooms exclude bathrooms, halls and rooms used for business.

Notes: The sample consists of children whose birth mother responded to the survey. Predicted probabilities are derived from marginal effects at the mean, based on logistic regressions.

Source: Statistics Canada, Aboriginal Children's Survey (ACS), 2006.

Notes

1. See Ip et al. (2009); Abrahams and Labbok (2011); Cidro et al. (2015); McIsaac et al. (2015a).
2. See Chirico et al. (2008); Labbok et al. (2004); Mew and Meredith (1992).
3. See Labbok et al. (2004); Brown and Magnuson (2000); Geddes et al. (2008).
4. See Health Canada (2015a, 2015b).
5. See Peat and Li (1999); Raisler et al. (1999); Banerji et al. (2009); Ip et al. (2009); Abrahams and Labbok (2011); Findlay and Janz (2012a); Findlay and Janz (2012b); Ye et al. (2012); Bowatte et al. (2015); Lodge et al. (2015); Karunanayake et al. (2016).
6. See Banerji et al. (2009); Findlay and Janz (2012a, 2012b); Ye et al. (2012); McIsaac et al. (2015a); Karunanayake et al. (2016). Findlay and Janz released two articles in 2012 on Aboriginal infant health in Canada: one on Inuit children and the other on off-reserve First Nations and Métis children. These studies used data from the 2006 Aboriginal Children's Survey (ACS), and found that parents were more likely to report their children as being in excellent/very good health if the child was breastfed.
7. This includes a small number of 6-year-olds. Children under 1 year were excluded from the study population because of concerns about the interaction between age and duration of breastfeeding for children who were most likely to still be breastfeeding at the time of the survey.
8. See Health Canada (2015a, 2015b).
9. Based on ACS questions on whether a child was breastfed or bottle-fed. Some children may have been introduced to solid food or pre-chewed food as infants.
10. See McIsaac et al. (2015b).
11. See Gao et al. (2008).
12. See Findlay and Janz (2012a, 2012b); Gao et al. (2008).
13. See Banerji et al. (2001).
14. See Oddy et al. (1999); Peat and Li (1999); Raisler et al. (1999); Lodge et al. (2015).
15. See Ye et al. (2012); Banerji et al. (2009).
16. This study's findings on asthma/chronic bronchitis among off-reserve First Nations children are consistent with the findings of a previous study on asthma and breastfeeding by Ye et al. (2012), which used the same dataset. However, in that study no distinction was made between Aboriginal identity and ancestry, nor between each of the three Aboriginal populations.
17. See Thomson (1994); Carrière et al. (2016).
18. See Thomas (2010).
19. See Karunanayake et al. (2016).
20. See Bowd (2005).
21. In this case, the results for the Métis and Inuit children were too unreliable to be discussed.
22. Inuit Nunangat includes the communities located in the four Inuit regions: Nunatsiavut (Northern coastal Labrador), Nunavik (Northern Quebec), the territory of Nunavut, and the Inuvialuit Region of the Northwest Territories.
23. See Ip et al. (2009); Abrahams and Labbok (2011); Ye et al. (2012); Bowatte et al. (2015); Lodge et al. (2015); Karunanayake et al. (2016).
24. See Coulibaly et al. (2006); and Freeman et al. (2008).
25. A small number of 6 year olds, however, were included in the survey.
26. See "Aboriginal Children's Survey, 2006: User's Guide to the Analytical File." This guide is not available online and must be requested through Statistics Canada's client services.
27. Note that the logistic regression models were tested with responses from all respondents (not just birth mothers), and although this increased sample sizes, there were no noticeable differences in the direction or statistical significance of the results.
28. See McIsaac et al. (2015b).
29. See Eldeirawi and Persky (2004).
30. See Peat and Li (1999); Eldeirawi and Persky (2004).

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